Boeing 737 CAP / FO Quick Reference Card (QRC) September 25, 2015

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• INTRODUCTION

DISCLAIMER *This document is **not** being kept up-to-date!*

The QRC ("**Q**uick **R**eference **C**ard") is a best effort summary of many need to know L-CAL 737 Flight Manual and Operations Manual items (certainly **not** everything, and **not** perfect)!

The QRC is for **training** purposes only and as always, the L-CAL 737 FM and L-CAL FOM are the absolute **final** word.

Legacy CAL, legacy UAL nor the FAA do not endorse the QRC.

Recommend Bill Bulfer's excellent **737 Cockpit Companion** and his **FMC User's Guide**. You can contact Bill at:
billbulfer@comcast.net

www.cockpitcompanion.com

Have a **safe** flight, and a good simulator MV / LOE

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• **CHECKRIDE HINTS**
• **VVM**: Verbalize, Verify, Monitor
• Use CRM! Call for QRH! On LOE: brief FAs, fill out logbook
• Carry Section 1 (Limitations) and Section 5 (P&P)
• Go slow, rotate slow (TO and MA), configure early
• Tip: "nail" the ADI pitch, and constantly check it.
• FMC Setup: before each takeoff, update:
- **PERF INIT Page**: ZFW, Temp, etc.
- **ROUTE Page**: ex: KIAH to KIAH
• WBBBBA: Weather, Build, Bug, Brake, Brief, Approach Descent

• PREFLIGHT

DEPARTURE BRIEFING (see Briefing Card)

ALTERNATES I STRONGLY SUGGEST TO REVIEW:
(FOM Quick Reference Guide p. 3 and 4.30.1)
• **Need destination alternate if**: Forecast ±1 hr. ETA, destination **below** 2000' **or** 3 miles (gouge "123").
For 1-1-3 and 1-1-2 rules, refer to:
(FOM 4.30.2 (EXEMPTION 8653)
• **Need 2 alternates if**: Destination **and** 1st alternate are "Marginal" (**Dest**: <400'/1mi - **Alt**: <600'/2mi)
• **Alternate Minimums**: HAT/HAA plus 400' **and** Cat I + 1 mile (**Or** if 2 Rwys/2 Approaches: +200' and +1/2 mile)
• IF diverting to alternate, then **regular** landing minimums apply, **and** no alternate for the alternate is required
• IF stronger headwinds cause you to fly into your Alt / Res fuel, you do **not** have to make an unscheduled fuel stop
This is "Dispatch" requirement **only**.
• IF en-route & destination weather goes down that would require an alternate, you may **continue** on if **both** Captain and Dispatcher consider it safe.
• Call **dispatcher** en-route if need to **divert**; he has "now time" data on weather, airports, and traffic situation
• OpSpec C067 (FOM 4.30.4) Flight may be dispatched w/o alternate if: - Destination forecast weather @ ETA to be at or above landing minimums and two hour fuel reserve added.

CHECKS / INSPECTIONS: (737 FM Chap. 3)
• **FLIGHT DECK SAFETY INSPECTION** (p.3.20.2)
• **ESTABLISH ELECTRICAL POWER** (p. 3.20.3)
• **FLIGHT DECK INSPECTION** (p. 3.20.4)
• **EXTERIOR INSPECTION** (p.3.20.5)
• **PREFLIGHT FLOWS AND CHECKS** (p. 3.20.12 – 3.20.39)
• **PREFLIGHT CHECKLIST** (p. 3.20.40)

FLIGHT PERFORMANCE:
(737 FM Chap. 5 and FOM Chap. 8)
• **Sabre Flight Plan Manager:** Final Weight Manifest is automatically sent to the ACARS printer along with the PERF INIT uplink when weights are finalized. Uplinked PERF INIT data must be verified against the printed Final Weight Manifest for accuracy.
PAX weights are Summer = 190;
Winter = 195 and compare to MGTOW

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• TAXI

ENGINE START:
• starter cutout at 56% N2 for NG
• **starter duty cycle:**
2 min **on**, minimum 10 seconds **OFF** between start attempts.

• For extended engine motoring refer to:
(737 FM Limitations 1.30.11)
• Key start **events**: starter valve OPEN, N2, N1, OIL PSI rising, FF, EGT (within 10 sec.; hot 725°C), starter cutout, OIL PSI by idle.
• High altitude starts above 8400' MSL: An indication of N1 rotation plus max motoring and a minimum of 20% N2 are required prior to introducing fuel to the engine. (FM 4.60.7)

• **ENGINE START MALFUNCTIONS: (except** for start valve) - **call for QRH**
- **before** start lever to "Idle": start switch **OFF**
- **after** start lever to "Idle":
- **before** starter cutout: "cutoff", motor for 60 secs
- **after** starter cutout: "cutoff", N2 below 20%, then motor for 60 s.

• ENGINE / APU FIRE ON GROUND
(See QRH FIRE PROTECTION Tab 80),

• When you are ready to taxi = flash taxi light once

• 2 min for engine to stabilize before takeoff or
5 min (if not flown in past 5 hours)

EQUIPMENT MALFUNCTION AFTER BLOCK OUT:
• Refer to MEL (FOM Chap. 5) refer to MEL temp. rev. and CDL
• **MEL**: Minimum Equipment List
- P code = performance penalty
- M code = Maintenance procedure; crew may position CB's or switches
- O code = Operation procedure
- use "system" number to find in MEL (**ex:** GPWS = 34-26)
• **CDL**: Configuration Deviation List
- additional limitations with secondary airframe and engine parts missing; penalties are cumulative.

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• TAKEOFF

RUNWAY VERIFICATION / ALIGNMENT PROCEDURE
• The runway alignment check meets the requirements of an FMC accuracy check

LOW VIS TAKEOFFS / ALTERNATE: (FOM QRG p.3)
• See LOW VIS takeoff minimums on Jepp plate 10-9A
• No lower than 500 RVR
• Need T/O Alternate IF:
- Departure field **below** landing minimums. Based on "**tower**" report of vis. or RVR. (FOM 4.30.1 / 2)
- must be within **400nm**.
Minimum for alternate = **same** as regular alternate

NO REDUCED THRUST WHEN: (737 FM 3.90.6)
• Anti-skid inop, • Reported or suspected wind shear, • Snow, slush, standing water penalty applied, • Either engine in ALT EEC mode, • FMC inoperative.
• when using "assumed" temp, throttles are set to reduced thrust
• the bugs will **always** show maximum thrust.

ORDER OF TAKEOFF BUGS: (737 FM 3.80.5)
5 bugs: from accuload **or** QRH **or [FMC]** (-7, -8, -9, -9ER)
• V1 **[1]** (Go / No Go, call "**V1**" at 5K **before** bug;
• VR **[R]** ("**ROTATE**"; normally double bug)
• V2 **[orange bug]**
• V2 + 15 **[white bug]**
• VM Flaps 0° **[UP]** ("clean maneuvering speed bug")
(Vref40+70 on PFD/ND displays)
• for "Improved Climb Performance", V1, VR, and V2 are **increased** and you **set** them on bugs.**- not** authorized IF: Anti-skid inop. **or** Snow, slush standing water penalty applied.

• when flying **below** VM Flaps 0°, flaps should be used, with the following "recommended" **after takeoff maneuvering speeds [FMC** -7, -8, -9, -9ER**]**:
[UP] VM 0 (VREF 40 + 70)
[1] VM 1 (VREF 40 + 50)
[5] VM 5 (VREF 40 + 30)
[10] VM10(VREF 40 + 30)
[15] VM15(VREF 40 + 20)

• VNAV may be selected on the ground prior to TOGA activation.
***Note:** L2 entries, and/or the selection of VNAV, cannot be made until all entries are made into the* **PERF INIT** *page. When arming VNAV for takeoff, it may be necessary to adjust the EO ACCEL HT to comply with non-standard Engine Out acceleration altitudes. Normally, Engine Out acceleration after an engine failure occurs at 800 ft. AGL. If obstacle clearance require non-standard altitudes, they will be noted on the 10-7 page or in the RMKS section of Accuload. Pilots are required to adjust the EO ACCEL HT on TAKEOFF REF page 2/2 LSK 4R*
• **Max tailwind** 10k up to 15k provided actual tailwind component does not exceed value authorized by Accuload Pilot Weight Manifest. Runway is clear and dry. Antiskid and thrust reversers are fully operational. Max takeoff rated thrust is used. Auto spoilers are used. (737 FM 1.20.2 and 1.20.6)
• **Max recommended crosswind** 34/33k dry / 25/25k wet runway / 15/15k standing Water/slush / 25/25k Snow-No Melting.
(737 FM 1.20.5)
• exterior lights when cleared to **"line up and wait"**.
• stabilize N1 40% ± 5% then press **TOGA**
"**CHECK THRUST", "THRUST SET xx %N1**"
• call "**100 kts,** call **V1**(5kts before)**, Rotate, Pos Rate, Gear Up**"
- concentrate on "100 knot" call (now reject **only** for "Engine Failure or Fire Warning"), **and** "V1" call (committed);
do V1 cut if "Engine Failure").
- rotate at 3°/sec, 15° pitch, **maintain** V2 + 20k (25k if lite)
- rotate S – L – O – W by **visually** looking at end of runway…
(if V1cut, this will help guide you to keep runway heading)
- 30° bank if V2 + 15 **[white bug] or greater…**
- if reduced thrust, push throttles up to bugs.

• **At 400ft**, Heading should engage if VNAV was selected on the ground (no call is necessary to enhance quiet Cockpit)
- try to delay turns until 400' AGL (50' minimum for: obstacles, engine out, noise abatement, adverse conditions)
• **At 800ft**, 10° pitch, V2 + 15 and accelerating:
- call " **Flaps 1 (or 5)"**
- must have desired speed preset in "**TGT SPD**" Climb page, L2
- call **VNAV** (if not selected on the ground) **OR**, if VNAV is not available **or** not desired:
"**LVL CHG, Set Clean Maneuvering Speed**, **Flaps 1 (or 5)"**
• **At 10,000ft or when cleared by ATC** select "**ECON CLIMB**" when ready to accelerate.
- next flap retractions at the fixed maneuvering speeds.
- call "**Flaps [UP]; After Takeoff Check**", climb at VM 0 **[UP]**, turn A/P on (**above** 800')
- for flaps 1 takeoff, retract at fixed speeds and accelerating
- hold VM Flaps 0 to 3000 AFE

• **NADP-1 Noise Abatement:** Normally VNAV departure to enhance Quiet Cockpit Concept
at **1500'**: Verify Aircraft reduces Pitch
at **3000'**: Verify Aircraft accelerates then raise Flaps on schedule
CALL: AFTER TAKE-OFF CHECKLIST

REJECTED TAKEOFF:
• **Below** 100k (any abnormality should be announced (e.g., system failures, configuration, fire or smoke, wind shear, etc.)
• **Captain** calls "**CONTINUE** or **REJECT**"; and accomplishes: **1)**close thrust levers, **2)**disconnect autothrottle, **3)**use RTO autobrakes (if available), **4)**raise speedbrake lever, **5)**apply maximum Reverse Thrust.
• Stay on runway, **hold** brakes (unless evacuation is necessary, then **set** brakes), and run checklists.
• **F/O** call **Tower**, **and PA** to "**remain seated**"
• Call for **REJECTED TAKEOFF** Checklist
consider brake cooling?, engine fire?, evacuation? (see signals), fill out Irregular Operations Report (**IOR**) (FOM 12.30.1)

ENGINE FAILURE AFTER V1:
• **ENGINE FAILURE**, maintain track (rudder), slow pitch up to 13°, positive rate, gear up, silence bell, V2 (orange bug) to V2+20k…
• **At 400'**: "**HDG SEL**", maintain heading, place 5 units of rudder trim towards good engine, radio call…
(if on **FIRE**, run **ENGINE FIRE CHECK LIST**)
• **At 800'**: "SET CLEAN MANEUVERING SPEED…. "
• **At Vm raise flaps on schedule, SET MAX CONTINIOUS THRUST**", call for **ENGINE FAILURE OR SHUTDOWN PROCEDURES DAMAGE OR SEPARATION** checklist**.**
(15° bank until V2+15)
• **Declare EMERGENCY**, sq. 7700, balance fuel, give FA "**T-E-S-T**", call company, get Wx, call for "**ONE ENGINE INOPERATIVE LANDING PROCEDURE**" checklist,
Consider restarting failed engine?
• **Failure in turn:**
YOKE first, then RUDDER, go to 800', etc.

WINDSHEAR: (737 FM 4.10.33 and FOM 7.10.3)
• Enhancements / Reactive = "windshear" on Grnd. Prox. test
• Predictive = "windshear ahead" on radar test
• At Airports w/o Terminal Doppler Weather Radar(TDWR) or Weather System Processor (WSP)
use **longest runway**, flaps 5, full thrust, Flight Directors **on**, use higher VR of RLL weight (737 FM 4.10.34)

VNAV should NOT be armed on GND in Wind shear conditions. TOGA must be pressed a second time passing 400ft. AGL to regain appropriate guidance in the event VNAV was engaged.

• **Windshear Escape**:"**MAX THRUST, STOW SPEEDBRAKE**", TOGA (do below 2000' RA); follow FD pitch; **no** trim, **no** config. changes; call radar altimeter **"Sink Rate".**
- if "Altitude Acquire", TOGA will go off, you must select again!
• **Windshear Gouge**: (alerts)
- **Windshear ahead** = avoid, go around (**trim** and **clean** up)
- **IN Windshear** = (**no** trim or configuration change)

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• ENROUTE

FMC/CDU:
• **DIR INTC**: "DIR INTC", then waypoint to R6
(NG: waypoint to L1, then enter "INTC CRS")
• **INTC CRS** always type **inbound** course, **not** radial…
• **DNTKFX**: set up on FIX page; non EFIS **only** works **this** side of fix; EFIS can define **either** way: IAH/15 or IAH/-15
• **ENTERING SPEED AND ALTITUDE**:
- can define speed **and** altitude (**ex:** 250/100)
- can define **speed** only (**ex:** 250/)
- can define **altitude** only (**ex:** 100)
- can define "at **or above**" alt (**ex:** 100**A**)
- can define "at or **below**" alt (**ex:** 100**B**)
• **FPA, V/B, V/S, VERT DEV** (on Descent Page):
- **FPA** = **actual** flight path angle (should be = or **steeper** than V/B)
- **V/B** = **computed** angle (vertical bearing to **meet** 3R crossing)
- **V/S** = **required** vertical speed to **achieve** the displayed V/B
- **VERT DEV** = **present** deviation from computed vertical path
(For EFIS / NG aircraft: LNAV **must** be engaged for this to be correct!)

MISC:
• **C° to F°:** double C° minus 10% + 32° (if above 0°) **or**
- 32° (if below 0°) **ex**: 18°C = 36 - 4 + 32 = 64°F
• **Crew Oxygen**:
- Over FL250 to 410: one pilot **wear** unless 2 pilots in seat
- Cabin altitude **over** 10,000': **both** pilots wear mask…
• **IFR Altitudes RVSM:**
- **West** = "Even" + 2k = 180, 200, 220……320, 340, 360, etc.
- **East** = "Odd" + 2k = 190, 210, 230…….330, 350, 370, etc.
• **DIVERSIONS:** to change destination station.
FMC RTE page / ACT RTE page1/3 -
ACARS / INFLIGHT / DIVERSION page –
• Be sure to figure "**bingo** fuel" to start diversion!
B urn **A** lternate **R** eserve

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• EMERGENCIES

GENERAL: (737 FM Sec. 2 & FOM Chapter 2)
• IF possible: F/O **fly** on A/P, Captain **resolve** problem.
• Declare an emergency **IF**: Engine loss, standby power approach, priority handling required, if about to break a FAR, etc. **Give**: Reason, Fuel (in minutes, ex.: 17.3 = 173 minutes), Souls Onboard Sq. 7700
• Notify Company **and** FA of emergency see EMERGENCY SIGNALS next page.
• Irregular Operations Report (**IOR**)(FOM 12.30.1)
• **On any problems, always call for "QRH"**

AUTOMATIC UNLOCK
(UAL - Boeing Flight Deck Door)
• **FLT DK DOOR lock selector ..... Rotate to DENY and hold for 1 second**

FLIGHT DECK DOOR EMRG ENTRY ACTIVE
(CAL - Jamco Flight Deck Door)
• **Flight Deck Door HARD LOCK Switch ..... PUSH**

CABIN ALTITUDE WARNING HORN / LIGHT IN FLIGHT OR RAPID DEPRESSURIZATION / EMERGENCY DESCENT

Boeing 737 CAP / FO Quick Reference Card (QRC) September 25, 2015

- **Crew Communications** ..... **ESTABLISH**
- **Seatbelt Sign** ..... **ON**

- **IF** Emergency Descent (damage? smooth air?):
- PA "**O2, RAPID DESCENT**", call ATC
- Descent gouge: "**PA**, **FLT, Spin, Spin, Pull, Pull**"
  (Make PA. Ignition **FLT**, **spin** MCP to 10M' or MEA, V/S **spin**, **pull** throttles, **pull** speed brakes, **LVL CHG** at barber pole)

LOSS OF THRUST IN BOTH ENGINES

- **Engine Start Switches (Both)** ..... **FLT**
- **Engine Start Levers (Both)** ..... **CUTOFF**
- **When EGT Decreases:** (EGT ↓ 3-5 secs)
  Engine Start Levers (Both) ..... **IDLE DETEND**

Notes:
- **Really** have dual engine flameout?...**OR loss of 2 Generators!!**
- N1 **and** EGT gauges **spool down**, "Low Oil PSI" lights up…
- If in **doubt**, push thrust levers up to see if you get **response**!

APU FIRE

- **APU Fire Switch** .....**CONFIRM**.....**PULL, ROTATE & HOLD**
  Rotate to the stop and hold for 1 second
- **APU Switch** ..... **OFF**

SMOKE FIRE OR FUMES

- **Oxygen Masks and Regulators** ..... **ON, 100%**
- **Crew Communications** ..... **Establish**

EMERGENCY SIGNALS:

- When a T.E.S.T briefing is required, alert lead F/A via Interphone or PA. Once briefed, the lead F/A will relay the briefing to the other F/A's and assign responsibilities "**T-E-S-T**": **T**ype of emergency, **E**vacuation (necessary?) **S**ignals, **T**ime to land. Also, **select ABA's**.
  (Pilots **do not** leave cockpit)
- Brace signal + 30 secs: "**BRACE! BRACE! BRACE!**"

- PA "**REMAIN SEATED, REMAIN SEATED**" = **Do not evacuate**

- **EVACUATION COMMAND**:
- PA "**RELEASE YOUR SEATBELTS AND GET OUT**"
  (Flight Attendants will specify which exits to use)

- **TRANSPONDER:**
- Hijack: 7500 (do NOT use 7700)
- Lost COMM: 7600 (stay VFR & land, **or** fly last clearance)
- Emergency: 7700 ("Declare Emergency")

SECURITY: (FOM 11.10.1)

- Inflight Disturbance Card: 3 or 4 incident levels, OSIR report
- Monitor 121.5; may have to radio "Mayday, Mayday!"
- **Inflight** Security Coordinator is **Captain**.
- **Ground** Security Coordinator is **Station** Duty Manager.
- **Bombs / Sabotage**: (FOM 11.50.1)
  Least risk bomb location: centered right aft galley door (2R)
- **BOMB ON BOARD** (737 FM 2.05.2)

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ARRIVAL BRIEFING - (See Briefing Card)
Pilot Flying Brief (other pilot flies):
- WBBBBA: Weather, Build, Bug, Brake, Brief, Approach Descent
- **Max recommended crosswind** (Landing) 40/37k dry / 40/37k wet runway / 20/20k standing Water/slush / 35/35k Snow-No Melting. (737 FM 1.20.5)

• APPROACH

ARRIVAL MANEUVERING SPEEDS:

[UP] VM 0 (VREF 40 + 70)
[1] VM 1 (VREF 40 + 50)
[5] VM 5 (VREF 40 + 30)
[10] VM10(VREF 40 + 30)
[15] VM15(VREF 40 + 20)
[25] VM25(VREF 40 + 10)

ORDER OF LANDING BUGS (5):

- **VREF [R]** bug for landing flaps (use APP REF page)
  - Normally VREF 30 or 40; single engine is VREF 15
- **Target [orange bug]** +5 min, +20 max; (see Target Speeds below). **if** using A/T (**throughout** auto land approach and landing), add **only** +5
  - If **ice** on tail, will have to **add** +10 to target
  (Add 10k **OR** wind + gust, whichever is **greater**, 20k max)
  - This is your "**go around**" speed with a **single** engine…
- **VREF + 15k [white bug]** (for flaps 30 **or** 40)
  - This is your "**go around**" speed with **both** engines
  - This is your Engine Failure in Landing Configuration speed
- **VM Flaps 0 [UP]** ("clean maneuvering speed")

TARGET SPEEDS: (737 FM 3.130.4)

- **VREF + 5** (1/2 steady state ***headwind component*** + full gust value, not to exceed 20 knots or flap placard minus 5 knots (whichever is lower).

  - **if** using A/T (autoland only) **only** add +5k (regardless of winds; A/T compensates)!
  - Single Engine: **do not** use A/T
- For examples on MCP selected speed bugs see (737 FM 3.130.4)

FINAL APPR. SEG. (FAS): (FOM 6.80.1)

- FAS = Final Approach **Segment** (FAF = Final Approach **Fix)**
- ILS = at "published" Glide Slope Intercept Altitude (GSIA) (**or** at glide slope intercept if **lower** than the GSIA)
- NP = at FAF (if no FAF, then at point where PT intercepts the inbound course.
- If **prior** to FAS, **must have** approach **minimums** to **start** approach. Note: **no** "look see" option!
- If **after** FAS, and visibility goes below minimums, **may**

GENERAL APPROACH GUIDELINES:

- All approaches based on **visibility**, ceiling is advisory.
  - there are **different** minimums if TDZ, CL, or ALS are inop!
- Must have visibility to **start** approach. If visibility goes below minimums **after** FAF, continue to DA (for NP to MAP).
- Use CAT-C (use CAT-D for circle) for correct Category check (737 FM Limitations 1.20.1)
- RVR: reported only if 6000 or less **or** prevailing visibility 1½ mile or less. Otherwise, ask for it.
- **Current** visibility governs:
  ex: "RVR 2400, variable 1100" = you are OK to land
- For **circle US TERPS**: Use the higher of category D minimums or 1000 ft. HAA and 3 sm. (FOM 6.100.3 Navigation)
- If conditions are below 4000 RVR or ¾ mile visibility, Autopilot, or F/D in the approach mode is required.
- When Landing Weather is below CAT I ILS minimums, an auto land is required, and the approach with the lowest minimums within the aircraft and Captains authorization should be briefed and flown. (i.e.: Cat III even if Cat II is legal)
- Items to brief: Missed approach; eng inop missed; non-normal / inop equip; terrain, transition level; 10-7 and 10-9 pages; mins (bugs), callouts, set next altitudes in MCP, use CRM, etc.; if emergency, consider longer runway, wind, systems.
- Considered "**ON**" Final Approach Course (to **start** descents): ILS/VOR: within **1 dot**
- You should be 200' AGL over end of strobes (about **1/2** mile from end of runway), **and** 50' AGL over threshold.
- Jepp plate DA (H): DA = decision altitude (H) = HAT
- **LOW VISIBILITY APPCH IF**: ≤ 2400 RVR.

- Monitor FMA for capture modes!
- Be configured by 1000 ft. AGL/RA.
- **Use** QRH Approach Briefing matrix to set up, call outs, mins, etc

ILS CAT I: • use **one** A/P - **NOT** coupled

- Downwind, "**FLAPS 1**"; base "**FLAPS 5, APPR. CHK**"
- "**CLEARED**" for the approach **AND** on **intercept** (use 30° hdg): arm "**APP**" (prior to 5° of course),
- **At** 1½ dots below G/S: "**GEAR DN, FLAPS 15, LDG CHK**"
- **At** G/S intercept, "**FLAPS 30 / 40, TARGET**"
  - Flaps 40° if low ceiling & vis (**CAT II, IIIA**), short & slick runway.
- **At 1000' –** Set Missed Approach Altitude.
- CAT I: If you see **strobes**, may go **below** DA to100' **above** TDZE, but **then** must have visual reference (**one** of ten items: lights, markings, etc), **or go around**.

- **Single Engine**: at G/S capture: **"DEAR DOWN, FLAPS 15, LANDING CHECKLIST"**; Target is VREF 15 + additive

- **ILS PRM:** Precision Runway Monitor (**use** QRH briefing matrix)
  - Brief Jepp page, MEL (ILS, TCAS and/or Transponder, 2 VHF)
  - #1 VHF on "Tower", #2 VHF on "Monitor"; adjust volume
  - TCAS on "TA/RA"
  - Hand fly "Breakouts": Do **not** push TOGA, A/P **OFF**, A/T **ON**, configure **after** established on new heading. PM turn FD's off, reset MCP (HDG, ALT, FD's on, LVL CHG, HDG SEL).

CAT II / IIIA CRITERIA: Only on NG Aircraft: -7 -8 -9(ER) The Captain is controlling the autopilot during the approach and performing a Coupled autoland. (2 Autopilots)

- **Use** QRH approach briefing matrix.
- CAT II, you must have visual reference **at** DH, which is 100' above TDZE).
- **CAT II, III Auto land:**
- **Auto land** = use **both** A/Ps: "A" A/P 1st, "B" after "APP" mode; Go Around = TOGA, call for flaps, gear, monitor. On missed, **B** A/P pops off, **A** A/P is now the master.
- Flaps **40°**, seat up, lights off until after touchdown

NON PRECISION APPROACH:

- **BASIC FMC SET-UP:** •Verify CRZ ALT was achieved. •Select procedure and transition. •Verify (GPx.xx) is available. •If RNP is controlling, refer to approach plate for appropriate value. Manual entry may be required. •If temp < -15°C refer to FOM cold temperature altimeter corrections – N/A for RNP approaches. • Distance rings from FAF, as desired. •VREF select. •WIND CORR select (if other than +5 knots). •Set DA or Ball Note with OAT > -15°C or charted temperature. •Barometric altimeter is controlling. •Set DDA (MDA+50 feet), using V/S or ball note not published.
- **RNAV (RNP): R**adios: Inhibit all VOR & DME updating from NAV OPTIONS page 2 prior to IAF. **N**otams: If dispatched for approach verify RAIM prediction in flight papers or via ACARS. **A**ltimeters: Set local, +/- 100 feet and verify CA and FO altimeters are within 100' before passing FAF, 2 Radio Altimeters required. **V**erify GPS updating from FMC NAV STATUS page 1 prior to IA. **R**NP manually set per approach Plate (as low as 0.11NM) -RNP≤0.15 NM can be hand flown. – RNP < 0.15 NM **two autopilots** required to begin approach. **N**avigate on 10NM scale or less (if appropriate). **P**ROG page 4: Monitor – XTK ERROR not to exceed RNP value left or right of course (IAF Inbound). – VTK ERROR not to exceed 75' from the PDI inside the FAF. ***Notes:*** *V/S back-up not permitted. Execute missed approach if: UNABLE REQD NAV PERF –RNP. FMC DISAGREE, or any VERIFY POSITION alert message from IAF inbound or continue visually if runway in sight. Loss of LNAV or VNAV path guidance on both displays and runway NOT in sight (FAF inbound).*
- Once cleared for the Approach **provided you have VNAV and LNAV engaged** you can set "TDZE, nearest 100 feet abv." in the MCP Window.
- **RNAV(GPS, GNSS, VOR/DME):** Manually set RNP (0.30 NM). Navigate on 10 NM scale or less (if appropriate). PROG page 4: Monitor XTK ERROR < 0.3 NM (IAF inbound)
- **VOR, LOC, LDA, SDF, NDB, LOC BC:** Raw data, if available, must be monitored. – For LOC BC approaches set the front course. – When unable to monitor raw data on the final approach segment of a VOR or NDB approach, VOR & NDB Final Approach Segment Substitution procedures as outlined in the FOM must be followed .
- if "VNAV SPD" shows, select PATH on Descent page:

- **Call Outs**:
  - "**1000**" (above TDZE based on radar altimeter)
    FP: **SET MISSED APPCHROACH ALTITUDE**
  - "**Approaching Minimums**" (DDA / MDA + 100')
  - "**Minimums**" (at DDA / MDA)
  - "**Missed Approach Point**" (approach lights **not** in sight)
  - "**Approach Lights in Sight**" **OR** "**Runway in Sight**"
- **disengage A/P** by 50' below DA / DDA / MDA,
- **disengage A/T** before 50' AGL…
- Missed Approach: be sure missed approach altitude is set!

- **TRAFFIC PATTERN:**
- downwind, "**FLAPS 1**"• base or IAF outbound, "**FLAPS 5**"
- when "cleared" for the approach and intercept heading:
  - "**VOR LOC**" or "**LNAV**"; call for "**LANDING CHECK**".
  - use V/S (**not** LVL CHG) to descend to next altitudes at 1000 to1500 fpm (**no** >1500 fpm, or GPWS will go off!)
  - no greater than 1000 fpm below 1000' AGL
- at LOC capture and ALT HOLD, **set** next altitude for stepdown
- **4 mi from FAF**: "**Gear Dn, F15, Ldg Chk, verify VNAV/LNAV is engaged, Set "TDZE" on MCP**
- **2 mi from FAF:** Flaps 30 or 40, Target
- at **FAF altitude** & **cleared appr**: verify MCP to **"TDZE"**
- follow NP Approach Setup matrix in QRH!
- At 1000' call out – FP calls "SET MISSED APPROACH ALT.
- approach must show "gradient path" (GP) or **cannot** use VNAV
  - if **no** GP, **use** prebriefed VVI rate on MCP (Vert Spd = VS)
- Will NP stepdown fix cross GP? If not, use VS to cross restriction; use Descent Page! DO NOT add ANY fixes after FAF!

  - **Single Engine**: at FAF / FAP, call for:
  "GEAR DOWN, FLAPS 15, LANDING CHECKLIST"

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MISSED APPROACH:

- **Must go around if**: (at minimums, and cannot land, or….)
  - **not** stabilized "in slot" by 500' abv. TDZE: glide path, trim, configuration, < 40% N1, AS -5k to +15k, ILS G/S > 1 dot or VNAV less than height of VNAV path pointer.
  - **GPWS**: Anytime you get a "whoop - whoop pull up, terrain, or configuration" warning you **must** do a go around. May disregard if **above** 500' day VMC; for **other** GPWS warnings you pull up **until** the warning goes away).
- "**Go Around, Flaps 15, Check Thrust, Positive Rate, Gear Up, Check MA Altitude**" ---- **fly VREF + 15 [white bug]**
- **At 400'**: "**HDG SEL**" or "**LNAV**" (if not previously set up)
- **At 800'**: "**LVL CHG, SET CLEAN MANEUVERING SPEED, FLAPS 5**"; "**FLAPS 1, FLAPS UP**(optional)…**After T/O Check**"
- **At 3000'** ---- call "**VNAV**" (if not previously engaged)
- **Rejected landing** is same, except **do not** attempt if thrust reversers were used.

- **Single Engine**:
- "**FLAPS 1, CHK THRUST, POSITIVE RATE, GEAR UP, CHK MISSED APPROACH ALTITUDE**"
- **At 400'**… "**HDG SEL**"
- **At 800' or** obstacle clearance altitude: "**SET CLEAN MANEUVERING SPEED**" "**FLAPS UP** (optional), **SET MAX CONT. THRUST**, "**ABBREVIATED AFTER T/O CHECKLIST**" (15° bank to V2 + 15).

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LANDING INFORMATION:

- **VASI** (**3 light**) 737 use **near** 2 (**Far** 2 for wide body)
- If given a "land and hold short of runway xx" clearance, you must have LAHSO approach information on 10-7 page.
- Braking action: **poor** = **no** room for error… **nil** = do **not** land!!!
- you may tend to flare too **high** if runway width is 200' due to depth perception; ie: keep it coming down!

LANDING WITH ENGINE OUT ON FINAL:

- AP / AT **OFF,** "**FLAPS 15**", Thrust **up**, (approx. 15%) VREF + 15k, GPWS inhibit **OR**
  If go around: maintain VREF + 15k, retract to FLAPS 1
- If on short final, consider leaving bad engine (with fire or failure) **running**, then take care of it **after** landing…
- Visual single engine glide path: 300'/mi ratio (ex: 6 mi = 1800')

WINDSHEAR:

- See wind shear techniques in Takeoff section.
- Target bug **set** for **normal surface** wind additive, **not** for A/S loss, but actually **fly** VREF + "A/S loss additive" (no > 20k) **OR** target, whichever is **greater**. Do **not** use A/T.
- ex: "Loss of A/S on final 10k":
  - wind 12G20 = +14 target; do **not** add to this
  - wind 12 = + 6 target; fly an **extra** 4k

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• SUPPLEMENTARY

ETOPS:

• Use ETOPS procedures outlined in (737 FM Chapter 3-1)

HOLDING NOTES:
- "Hold East on 090 radial" ("Standard" = **Right** turns)
- Must start to slow down within 3 min. of fix (should receive holding instructions within 5 minutes)
- **Speeds**: MHA thru 6000" = **200k** max; > 6000' thru 14M' = **230k** (210k where published); >14M' = **265k**
- **Inbound times**: (adjust outbound leg to get inbound time) 14,000' or **less** = **1 min**; **over** 14,000' = **1½ min**
  - small box with number is published time in minutes for pattern.
- **Call**: "Position, Time (Z) and Altitude" upon entering…
- If no pattern charted and no instructions, hold **standard pattern** on **inbound course** to fix, at **last assigned altitude.**
- Be sure to figure "**bingo** fuel" to start diversion!
  B urn **A** lternate **R** eserve
- Send ACARS "APPR. DELAY" message

TRAINING: L-CAL 737 FM Chapter 4.70.1

- **CFIT / "TERRAIN":** "**MAX THRUST, STOW SPEED BRAKE",** AT / AP off, roll level, 20° pitch, keep gear and flaps, call out radar altimeter **"SINK RATE".**

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Updates: 2-2015 – FM REV 3-15, Revised Text